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ABSTRACT

This paper presents a model and conceptual framework for textbook research. The model will help scholars from a variety of disciplines approach textbook research from a common theoretical grounding and later compare and synthesize their findings using agreed-upon categories and a shared vocabulary. The author first describes two rudimentary models for textbook research developed by Cronbach in 1955 and by Tudor in 1978. She then presents her own systems approach to textbook study. The model is based on an ecological paradigm. It positions the textbook within the educational suprasystem of the socio-cultural metasystem. The textbook is viewed in relation to five subsystems of the educational system: the educational delivery system, the family system, the government system, the knowledge production system, and the knowledge distribution system. The textbook shares in the history of ideas, the history of education, the technology of printing, research and theory on the teaching-learning process, the sociology of knowledge, and the commerce of publishing. In use, the textbook enters the classroom subsystem of the educational delivery system. There texts generate or fail to generate processes that shape minds, attitudes, and ideas. Textbooks-in-use produce both intended and unintended outcomes. From the perspective of the systems model, such feedback may be viewed as a function of ecological fit. (RM)

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A MODEL OF THE TEXTBOOK IN THE ECOLOGY OF EDUCATION

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ABSTRACT

This paper proposes a systems model and accompanying conceptual framework as a paradigm for the development of a comprehensive theory and platform for textbook research. It examines two earlier process-product models: (1) the linear model proposed by Cronbach et al (1955) and the interactive model proposed by Tudor (1977). Thompson's model is based on an ecological paradigm. It positions the textbook within the educational suprasystem of the socio-cultural metasystem. The textbook is viewed in relation to five peer systems: the educational delivery system, the family system, the government system, the knowledge production system, and the knowledge distribution system. The knowledge industry is identified as a subsystem of the knowledge distribution system and the classroom as a subsystem of the educational delivery system. The peer systems interact to influence the structure and content of textbooks. From the systems perspective, textbook effectiveness can be viewed as a function of ecological fit among the systems identified in the model.

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The textbook has been a fixed feature of American education since Colonial times. However, the textbook qua textbook has been little studied. Quest (1918) assayed the first general treatise on the textbook. He urged that "dispassionate investigation" of the textbook was an imperative for "the best progress in the schools."[1] Edmonson et al (1931) produced "The Textbook in Education," a state of the art volume for the 30th Yearbook of the NSSE. In Text Materials in Modern Education (1955), Cronbach et al sought to provide a comprehensive theory and platform for textbook research that would generate empirical studies. A quarter of a century later, Walker (1979) noted the failure of the Cronbach Report to realize this lofty objective.

Much has been written about the textbook in the intervening years. Writers and researchers have touched on many significant issues concerning textbooks. There is general agreement among them on problems related to textbook development and use. However, most scholars and writers deal with individual textbooks or textbooks of a certain type. As Goldstein (1978) notes, "Questions are rarely asked about the underlying forces that shape instructional materials."[2] He suggests that one reason for this is that we approach such problems individually rather than as parts of an interlocking network.[3]

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A model of the textbook in education could do much to offset such criticism. Models provide "mindholds" for the organization of data. A model with an accompanying conceptual framework is needed so that scholars from a variety of disciplines can approach textbook research from a common theoretical grounding and later compare and synthesize their findings using agreed-upon categories and a shared vocabulary. Cronbach (1955) and Tudor (1978) devised rudimentary process-product models of the textbook.

The Cronbach Model: A Linear Paradigm

The Cronbach Report presents a model of the textbook based on Berlo's classic source-message-channel-receiver communications paradigm. In this model, textbook development proceeds in linear fashion from the resources of the culture via the author past a series of "gatekeepers." The textbook is the product of a process initiated by a communication source --▸ proceeding via an encoder --▸ with a message --▸ in a channel --▸ reaching the decoder --▸ and finally the receiver.[4]

Fig. 1, based on the Cronbach model, identifies the author as the first gatekeeper who selects the message from the cultural storehouse of the human race. The author encodes the message in the typescript and delivers it to the publisher, who becomes the second gatekeeper, determining whether or not the materials will appear in print. The textbook released by the publisher encounters one or more gatekeepers during the textbook selection and adoption process. Once in the school, the educator becomes the gatekeeper who determines which messages in the textbook reach the pupil (or educatee). Dwayne Huebner's

values-free term "educatee" is here used to identify the broad class of persons who are exposed to education and to textbooks. The educatee is the final gatekeeper who notes and stores -- or fails to note and store -- the message or messages thus conveyed.

While the Cronbach model accounts for textbook production in a very general way, it does not convey the complexity of a system in which a number of factors operate simultaneously to shape the product outcome.

The Tudor Model: An Interactive Paradigm

Tudor (1978) adapted an engineering model of design feasibility to the textbook production process. His model contains certain "real world" features that the Cronbach model does not. Tudor views the textbook as part of the "gestalt" of teachers. In his model, editors are the "engineers" of textbook technology. As shown in Fig. 2, Tudor has identified the factors that shape the product outcome as (1) "state of the art" constraints and resources, and (2) "demand" constraints and resources.[5] The Tudor model discloses some of the interacting factors that are known to influence the textbook product outcome. Although the Cronbach Report touches on these factors when discussing influences on the publisher's decision-making process, they are not included in the model.

The Systems Model: An Ecological Paradigm

Data relevant for textbook research and theory-building is drawn from diverse disciplines. Boulding (1979) defines a general system as "any theoretical system which (is) of interest to more than one discipline."[6] Forsdale (1981) observes that

the general systems approach suggests that we cannot, with much profit, look at elements singly and independently. He says, "Many model-makers strive to see a whole framework without singling out individual elements except for momentary convenience."[7] As explained by Sutherland:

> the general systems theorist tries to approach phenomena with a prior (and necessarily crude and tentative) comprehension of the entity as a whole, a comprehension which will serve the role of a flexible, empirically responsive heuristic.[8]

Such is the intention here. Our aim is not so much to divulge something novel or original but rather to disclose the textbook universe as it is in all its mundane reality. Applying a systems approach to textbook study requires us to make a perceptual shift in our customary view of the textbook. Instead of seeing the textbook as an end product, a fait accompli, as it were, it requires us to see it as part of a larger, dynamic system operating as a whole. The model allows us to predict that a change in one part of the system will more, less, or equally affect other parts of the system. Moreover, it provides a frame of reference for testing that prediction empirically.

Cronbach introduced the concept of the "text-in-use" as a component of the micro-environment of the classroom system. The present model positions the textbook in the macro-environment of the educational system. As it moves through the system it is viewed differently. The model draws together all the factors that influence the textbook as an output of the system.

Goodlad et al (1979) suggest that ecological theory as defined by Margalof provides insight into educational processes:

> Ecology ... is the study of systems at a level in which individuals or whole organisms may be considered elements of interaction, either among themselves or with a loosely organized environmental matrix.[9]

Evolving from Cronbach's linear communications model to Tudor's interactive engineering model to the present ecological systems model enables us to identify processes that influence the textbook that occur outside the confines of the educational system as conventionally understood.

The Textbook Universe

Asked where theoretical ideas come from, the Nobel prize winning physicist Paul Dirac replied, "You just have to try and imagine what -- the universe -- is like."[10] The same challenge confronts the would-be textbook theorist.

Time: The Overarching Factor

Adams and Biddle (1979) comment that time is obviously precious in education. It might be said of textbooks as it has been of education generally, that "time as a dimension to be accommodated is both a necessary condition and an embarrassment. It is much more convenient to ignore it than to acknowledge it."[11] Timing is important to textbook publishers. Textbooks must fit into the timeframe of a particular course and curriculum. They must meet deadlines imposed by textbook adoption cycles and selection committees. Rodman (1975) asks whether textbook revisions are made because of the rapid pace of advancing knowledge or are activated by the greed of textbook authors and publishers. He suggests that educators take a closer look at "the forces that have shortened the lifespan of textbooks."[12] The present model affords a means of doing so.

The Socio-Cultural Metasystem

The political, economic, and socio-cultural metasystems interact continuously. Each inputs into the system that produces textbooks. Admittedly, these systems influence textbooks and these influences deserve to be identified. The central position of the socio-cultural metasystem in the model is due to its educative purpose.

The socio-cultural metasystem incorporates the "cultural storehouse" to which Cronbach alludes. It embraces the entire cultural and intellectual history of the world. This includes attitudes, standards, values, sensibilities, traditions, and social and educational objectives. It includes religion, technology, language and literacy, the knowledge stock and knowledge systems. It includes also the symbols and symbolic systems available to a culture. In sum, they represent a society's symbolic capital.

The symbols incorporated in a social system give objects and events their human significance. This is true also of textbooks. Not only are textbooks embodiments of a society's symbolic capital, they are also cultural artifacts that gain significance through symbolic interaction in a number of settings. This viewpoint adds another dimension to Cronbach's concept of the text-in-use. Thus, while a textbook contains symbols that create shared meaning for a group of educatees, the textbook itself is a symbol of learning. Apart from the knowledge communicated by the text-in-use, interaction among educators, educatees, and textbooks in the micro-environments where learning occurs possesses considerable symbolic meaning.

The socio-cultural metasystem supports conflicting world views, opposing philosophical traditions, incompatible ideologies, and contrasting ethnocentric perspectives. These form part of the textbook's intellectual horizon and cannot be ignored. At different periods of time and under different social conditions, different items from the stock of culture will be selected for presentation in textbooks. Examples of this recently surfaced in the controversies related to "creationist" vs. "secular humanist" versions of evolution in science textbooks (Nelkin 1977).

Technology is a pervasive cultural influence. In Winner's view, "technologies are ways of building order in our world."[13] Technology affects our way of being, doing, seeing, communicating, and educating. Textbooks are a form of educational technology. Moreover, textbooks are shaped by the "hard technology" of printing and publishing, the "soft technology" of writing, editing, designing, and illustrating textbooks, and the "managerial technology" operating in textbook publishing houses.

The Educational Suprasystem

The educational suprasystem is a subsystem of the socio-cultural metasystem and is differentiated from it by its "people processing" function. Cremin (1980) views education as "the deliberate, systematic, and sustained effort to transmit, evoke, and acquire knowledge, values, attitudes, skills or sensibilities, as well as learning that results from the effort, direct or indirect, intended or unintended."[14] The present model is compatible with this view. Moreover, it encourages analysis of the intended and unintended outcomes as forms of

feedback into the system.

Peer Systems in the Educational Suprasystem

Five peer systems, which are subsystems of the educational suprasystem, have major effects on the system as a whole. They may promote or inhibit the broad purpose of the educational suprasystem which is to make the human, material, and intellectual resources of a society available for educative processes. The society inputs its demands for certain kinds of outcomes, including levels of preparation and attainment, materials and media, resulting in a wide assortment of educatees. The political and economic metasystems also input their demands. However, we are focusing here on those outputs of each system that input into the educational suprasystem.

The five peer systems are the educational delivery system, the family system, the government system, the knowledge production system, the knowledge distribution system and that segment of the knowledge distribution system termed the knowledge industry. For our model, each system is characterized by its major educational purpose or function.

The peer systems operate interdependently. They are in constant interaction. Thus, although the model shows them as relatively separate and distinct, they are in fact dynamic entities -- expanding and contracting and involved in numerous transactions across their boundaries in response to changes in the system as a whole.

The Educational Delivery System

The educational delivery system in the United States is broad and encompassing -- including both traditional and non-

traditional educational environments at all levels -- from pre-school through post-graduate study. Each of these represents a unique market for educational books, including textbooks. Thus the educational delivery system -- which includes the public schools -- is the user system for textbooks of all kinds. Textbooks provide one means by which educational institutions can achieve their people-processing purpose by delivering knowledge to the educatee.

The Family System

The family system provides the basic human capital for all the metasystems. It provides the educators, educatees, and workers for the educational suprasystem. Although the family shares some functions -- such as culture transmission, social integration, and personal development -- with the educational delivery system, it also places the demand on the system to provide education for its members of all ages and with varying interests and abilities.

Changes in the structure, composition, and goals of the American family affect the home-school relationship. Changing concepts of the family's role in education influence such features of the educational delivery system as the length, duration, and purpose of schooling, the curriculum, and those textbooks made available to educatees. Confronted with demands on the part of spokespersons for the family that social change be reflected in textbooks (especially with respect to eliminating stereotypes) some school administrators argue that change is difficult because it is expensive to buy new textbooks.[15]

The Government System

In the United States, the government system has no direct influence on textbook publishing. However, the Constitution provides the federal government with a broad mandate to protect intellectual freedom, individual liberties, and intellectual property. Nevertheless, government agencies at the federal, state, and local levels influence textbooks both directly and indirectly. Federal, state, and local government agencies are charged with varying responsibilities for education. Federal funds may be channeled through state and local agencies and affect textbook budgets. State and local governments are specifically charged with responsibility for the selection of textbooks paid for with public funds. Federal grants in the 1950s took the initiative in supporting curriculum research in the fields of science and mathematics that eventually resulted in major textbook innovations in the 1960s.

Congress in 1957 established the U.S. Commission on Civil Rights, a temporary, independent, bipartisan agency. The agency received a mandate to examine areas of discrimination in textbooks, including a study of the representation of minorities, the elderly, and the handicapped in textbooks. The Commission acknowledged the profound effect that textbooks have on personality development and behavior

> Textbooks provide children with information that broadens their scope of knowledge and allows them to experience, test, and solve problems arising in their own lives. At the same time that a pupil is learning social studies, mathematics, and reading, textbooks are influencing the child's self-esteem, values, aspirations, and fears.[16]

This federal involvement has had a continuing effect on curriculum and textbook content.

The Knowledge Production System

Ideas, information, and knowledge flow throughout the political, economic, and socio-cultural metasystems creating the Zeitgeist or unique spirit of an era. Our present age is in the midst of a so-called information explosion. This creates unique challenges for textbook technologists. The main purpose of the knowledge production system is to refine old knowledge and create new knowledge in the form of ideas, theories, and applications through a variety of scholarly and research endeavors. The output of the knowledge production system becomes part of the knowledge stock of the socio-cultural metasystem. Sooner or later, portions of this stock, through the process of diffusion, finds its way into textbooks of one kind or another.

Creative scholarship -- involving both the rigorous examination of relationships among phenomena through research and the development and testing of theory -- may be undertaken by persons both in the academic community and the "r and d" laboratories of business and industry. Their findings demand, on occasion, a radical restructuring of knowledge systems in order to conform to a new model of social or physical reality. As Kuhn elaborates:

> That is why a new theory, however special its range of application, is seldom or never just an increment to what is already known. Its assimilation requires the reconstruction of prior theory and the re-evaluation of fact, an intrinsically revolutionary process that is seldom completed by a single man and never overnight. [17]

This process, which Kuhn calls paradigm change, has profound implications for education in general and the writing, editing, designing, and illustrating of textbooks in particular. Some textbook revisions are merely cosmetic. They involve no more than an incremental change in content or updating. New information is merely added to old. By contrast, the truly innovative textbook reflects paradigm change in its organization and presentation of knowledge. Indeed, the first books written to delineate a new academic discipline and that lay its foundations, organize its principles, and hasten its maturity serve as textbooks for many years.[18] Euclid's Geometry ranks among these textbook classics.

Chargaff (1980) disparages the value of knowledge produced "on the assembly line" of wholesale, publicly funded research. In his view, "Real seekers of knowledge keep well hidden, and it is mostly not new knowledge they are after, but old and solid knowledge."[19] Moreover, he declares, "The existence of multiple competing textbooks has nothing to do with the thirst, or the search, for knowledge."[20] In light of this, we must re-examine the popularly held view of the textbook as a repository for the received wisdom of the ages.

The Knowledge Distribution System

The unifying purpose of the knowledge distribution system is to move, transfer, transmit, and communicate the facts, theories, ideas, information, and knowledge outputted by the knowledge production system throughout the political, economic, and socio-cultural metasystems. The model differentitates the knowledge production and knowledge distribution

systems because, while their functions are complementary, their purposes are different. The two systems reinforce each other and transactions occur across their boundaries continuously. For example, Coser et al (1982) note that the advisory editors employed by college textbook publishers amount to "invisible colleges" of academic specialists who play the role of middlemen.[21] Indeed, they are gatekeepers of ideas. Similar tasks are also performed by advisors to elementary and secondary school textbook publishers. In our model we might identify such persons as knowledge brokers who operate between the knowledge production system and the knowledge distribution system.

The Knowledge Industry

Early in the century, Cubberley (1927) pointed out that the business of preparing textbooks for use in the schools had become a great American business of a type unknown in any other land. By the 1930s the textbook publisher had become the pivotal factor in the development and distribution of educational materials. Machlup (1962) coined the term "knowledge industry" that embraced, among others, such sectors as education, the media, and information machines.

The primary purpose of the knowledge industry sector of the knowledge distribution system is the dissemination of information and knowledge for profit. Knowledge is a commodity in an entrepreneurial system. Textbooks are a major commodity in the product mix outputted by the knowledge industry.[22] The knowledge industry also utilizes other media for the commercialization of knowledge.

Satellite Systems

Satellite systems are institutions, agencies, and organizations that operate independently in relation to one or more peer systems in the educational suprasystem. They function sometimes as monitors of the system, providing positive and negative feedback to the system's various sectors and sometimes as change agents in one or more sectors of the system. Some satellite systems are ephemeral and transitory. Others are more enduring.

Among the satellite systems identified in the model are the Center for the Book, the Association of American Publishers, the National Association of Textbook Administrators, the Educational Products Information Exchange Institute, the Educational Testing Service, and such textbook critics as the Texas-based Educational Research Analysts headed by the Mom and Pop team of Mel and Norma Gabler. In addition, such organizations as research foundations, university presses, learned societies and professional associations, organized religious bodies (including the Creation Science Institute), parent-teacher groups, and knowledge storage and retrieval systems (including libraries of all kinds) influence the system's functioning. In-service workshops for educators, while short-term, can have major input into the system. When organized by knowledge industry conglomerates they may hasten the adoption of a particular textbook or textbook series. Collectively, the satellite systems, while pursuing their own primary purposes, contribute to the over-all equilibrium of the educational suprasystem.

Conclusions

The educational enterprise is a dynamic component of the socio-cultural metasystem, and the textbook has established its secure niche in the ecology of education. The model discloses that the textbook shares in the history of ideas, the history of education, the technology of printing, research and theory on the teaching-learning process, the sociology of knowledge, and the commerce of publishing. In use, the textbook enters the classroom subsystem of the educational delivery system. There texts generate or fail to generate processes that shape minds, attitudes, and ideas. Textbooks-in-use produce both intended and unintended outcomes. From the perspective of the systems model, such feedback may be viewed as a function of ecological fit. The utility of the proposed model of the textbook's niche in the ecology of education can best be tested as it is applied to diverse types of inquiry related to textbooks.

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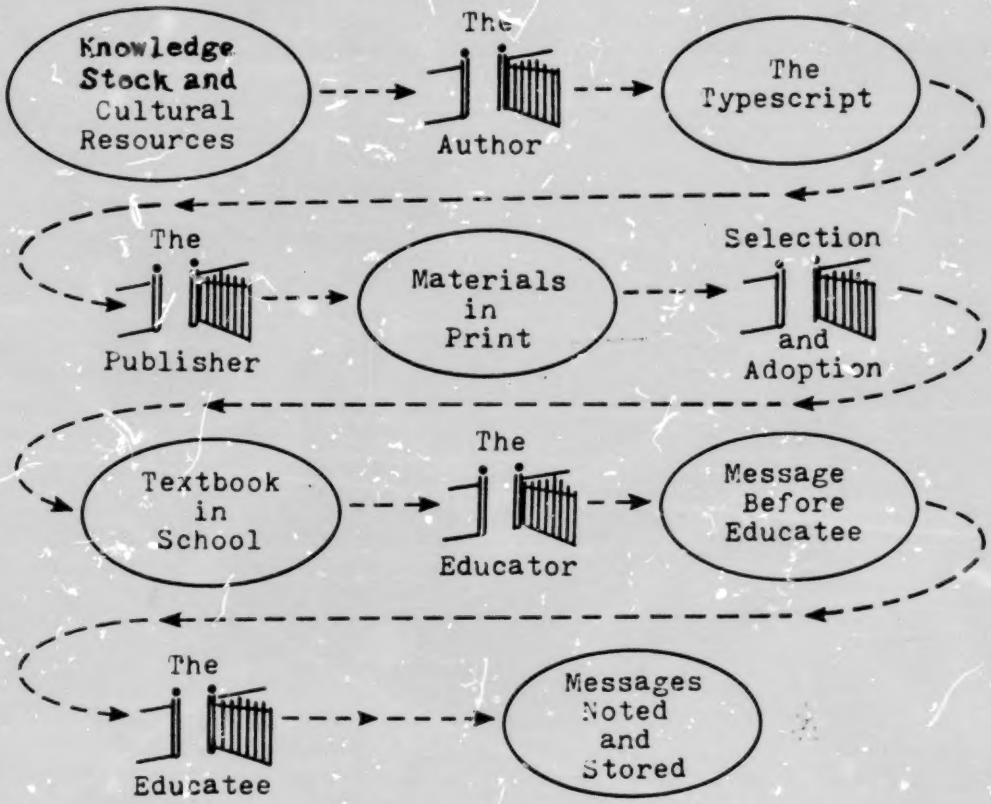
APPENDICES

Figure 1

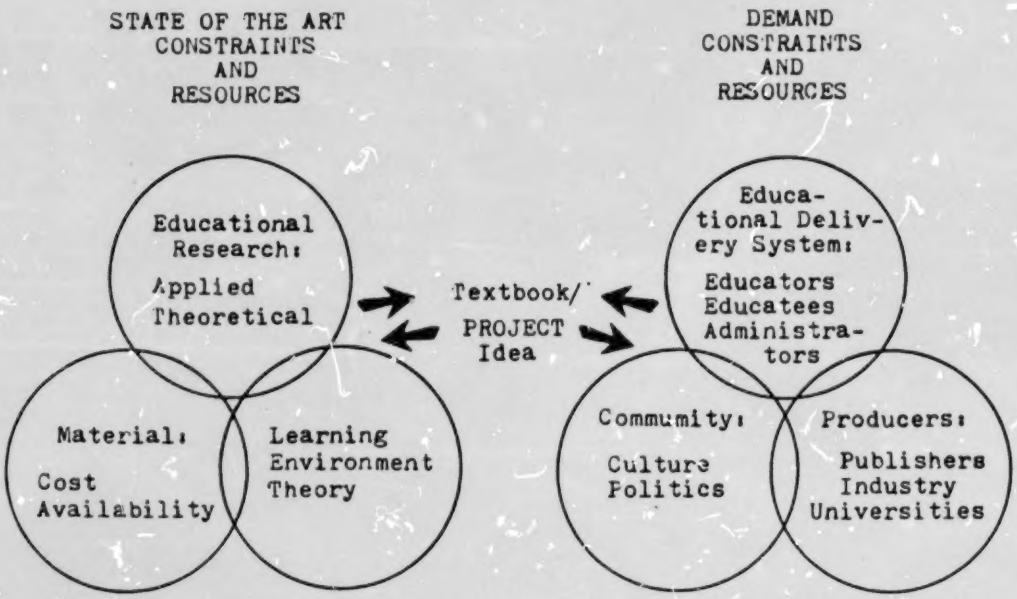
THE CRONBACH MODEL: A LINEAR PARADIGM*



* Adapted from Cronbach Report, p. 96.

Figure 2

The Tudor Model: An Interactive Faradigm



Tudor developed a model of design feasibility for an educational project on an engineering model. His conceptualization accounts for the interaction of a variety of factors on the product outcome.

1. Michael Tudor. Lecture. Teachers College. 24 March 1978. The above diagram has been adapted to keep the categories consistent.

THE SYSTEMS MODEL: AN ECOLOGICAL PARADIGM

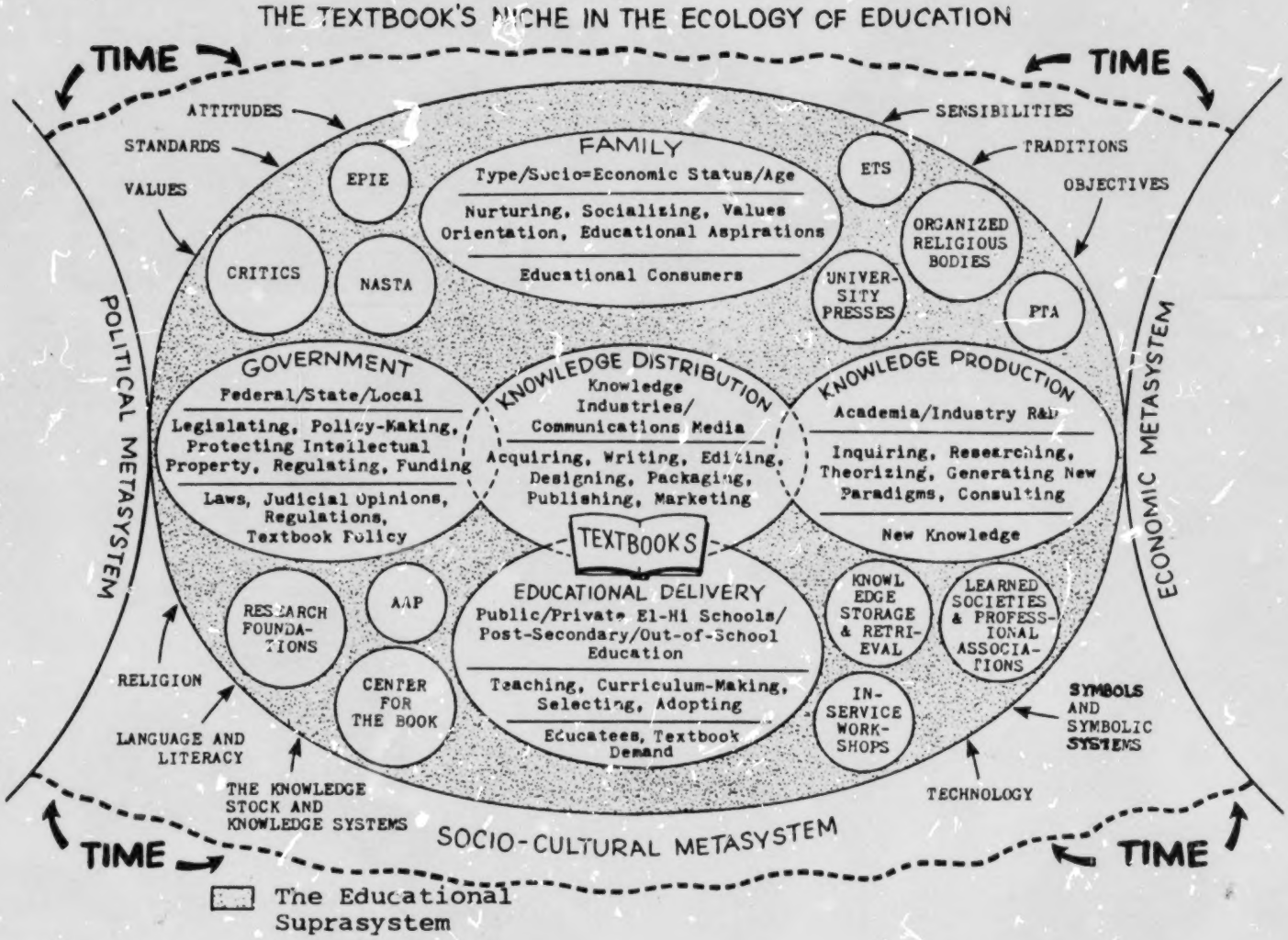


Figure 3

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